The Role of Agriculture

and the

Agricultural Products Industry

in the

Economy of Western Massachusetts

prepared for:

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Spring 1987

The Role of Agriculture and the Agricultural Products Industry in the Economy of Western Massachusetts

Contents

Introduction

This report provides an introduction to the subject of the role of agriculture and the agricultural products industry in the economy of Western Massachusetts. The first section provides an overview of the agricultural sector, noting, among other things, that in 1982 that sector contributed $233 million to the Commonwealth's gross product. The second section reviews the range of agricultural products (from specialty food products, to agriculturally oriented biotechnology companies to processing and packaging concerns) which the area does and might support. The final section describes a proposed University-Industry Partnership designed to provide scientific, technological and economic research assistance to the food and agribusiness industry.

It is anticipated that this report will serve to: a) provide descriptive, background information and b) stimulate discussion and support of the activities described.

This report is a result of the collaboration of individuals serving as a Sub-committee on Agriculture and Forestry of the Western Massachusetts Economic Development Conference (WMEDC). The Conference is an umbrella group of entities concerned with regional economic development in the four counties of Western Massachusetts. It's purpose is two fold:

1. To provide a forum for communication among the multitude of people and organizations in Western Mass. involved in economic development.

2. To provide a vehicle for regional and cooperative action when the need exceeds the scope of a single organization.

The sub-committee on Agriculture and Forestry previously sponsored a report on the Forest Products industry prepared by Derrick Mason of the Wood Industry Project of the Hilltown Community Development Corporation.

This report is the result of the collaboration of a number of individuals, including the following:

- Rick Feldman, CRD Program Director, Massachusetts Cooperative Extension
- John Pontius, Small Farms Specialist, Massachusetts Cooperative Extension
- Michael Kane, Co-ordinator, Northern Tier Project

The Massachusetts Cooperative Extension, at the University of Massachusetts in Amherst, provides educational support for, among other, agricultural producers in Massachusetts based on research and other work done at the University. It is a cooperative program linking the federal, state and local levels. The Northern Tier Project focuses on the economy of the sub-

regions of North Adams, Gardner, Athol and Greenfield. Mt. Auburn Associates prepared a Report dated June 20, 1986 for the Massachusetts Executive Office of Communities and Development and the Northern Tier Strategic Analysis Advisory Committee. Excerpts from that Report, entitled "The Northern Tier Economy: A Strategic Analysis" are contained herein.

Penelope Kim, convener of the sub-committee, has served as compiler and editor of this report. She acknowledges with gratitude the assistance and contributions provided by:

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I. Agriculture in Western Massachusetts: An Overview

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Introduction

Agriculture in Western Massachusetts has always been and still is an important economic activity. The Connecticut River Valley has excellent agricultural soils allowing the region's agricultural activity to yield millions of dollars worth of farm products. Of the Commonwealth's 48 significant agricultural towns, (towns with at least 2500 acres of farmland or 900 animal units), 29 are in Western Massachusetts.

This report relies on statistics collected by the U.S. Census and by the Massachusetts Department of Food and Agriculture. These statistics will be supplemented by data collected by researchers of the Department of Agriculture and Resource Economics of the University of Massachusetts.

The Farm Picture

Until the early 1970's the number of farms and the amount of farmland was decreasing. Since 1974 there has been an increase of 20 percent in the number of farms in Western Massachusetts (see table 1). The amount of land in agriculture has remained relatively constant since 1974 and thus the average farm size has decreased (from an average of 167 acres in 1974 to an average of 143 acres in 1982). In 1982 farmland accounted for 14 percent of the land in Western Massachusetts.

TABLE 1

LAND IN FARMS IN WESTERN MASSACHUSETTS

County	Number of Farms				Land in Farms (acres)				% land in Farms
	1969	1974	1978	1982	1969	1974	1978	1982	1982
Berkshire	380	305	323	352	80,730	73,110	72,648	73,434	12
Franklin	550	404	457	521	92,285	72,909	80,340	79,412	17
Hampden	367	311	366	392	45,908	42,123	43,432	43,835	11
Hampshire	664	495	493	559	80,851	64,891	61,194	63,624	18
Total:	1,961	1,515	1,639	1,824	299,774	253,033	257,614	260,305	14

Source: 1982 U.S. Census of Agriculture

The total market value of agricultural production in Western Massachusetts in 1982 was estimated to be $79,192,000. Table 2 presents values for both crops and livestock per county. The dairy sector was by far the most important sector of the region's agriculture with a market value of $38,731,000. Vegetable production yielded $6,912,000; nursery production was third with $6,738,000; poultry accounted for $5,759,000; fruit production yielded $5,606,000; and cattle and calf production was sixth with $4,948,000. Hampshire County produced 32 percent of the total market value of agriculture production in the region; Franklin County 27 percent; Berkshire County 21 percent; and Hampden County 20 percent.

TABLE 2

MARKET VALUE OF SALES: WESTERN MASSACHUSETTS FARMS for 1982 (sales in $1,000)

	Berkshire	Franklin	Hampden	Hampshire	Total
Dairy	11,098	12,445	5,143	10,045	38,731
Poultry	1,171	268	858	3,462	5,759
Cattle & Calves	1,307	1,626	642	1,373	4,948
Sheep & Lambs	35	50	25	76	186
Hogs & Pigs	43	33	46	454	576
Other Livestock	198	307	99	180	783
Tobacco	-	74	1,489	931	2,494
Grain	199	113	6	478	796
Hay & Silage	563	565	323	495	1,946
Vegetables	450	1,663	2,634	2,165	6,912
Fruit	430	2,201	1,728	1,247	5,606
Nursery & Greenhouses	1,007	1,334	2,000	2,397	6,738
Other	41	876	579	2,221	3,717
Total:	16,542	21,555	15,572	25,523	79,192

Source: 1982 U.S. Census of Agriculture

Table 3 lists the ten most important vegetable crops in the region by acres of production. By far the most important crop by acreage is potatoes with 4026 acres. Other important vegetable crops are: sweet corn-1972 acres; squash-644 acres; cucumbers-513 acres; head cabbage-466 acres. Hampshire county has 4159 acres in vegetable production; Franklin has 2273 acres; Hampden has 1976; Berkshire has 429 acres.

Tables 4 and 5 list acreages for tree fruit and small fruit. The largest acreages in these two groups are devoted to apples-2910 acres. Franklin and Hampden counties, (999 acres and 893 acres respectively), have the largest acreages of this commodity. The small fruit industry is increasing in size and should become a much more important factor in agriculture in Western Massachusetts in the future.

TABLE 3

THE TEN MOST IMPORTANT VEGETABLE CROPS BY ACREAGE PLANTED IN 1982 IN WESTERN MASSACHUSETTS

	Berkshire	Franklin	Hampden	Hampshire	Total
Potatoes	38	1321	255	2412	4026
Sweet Corn	285	264	707	716	1972
Squash	n.a.	117	103	424	644
Cucumbers	3	209	63	238	513
Head Cabbage	9	126	223	108	466
Carrots	1	16	156	52	225
Pumpkins	44	47	45	40	177
Sweet Peppers	4	22	92	49	167
Tomatoes	5	31	78	25	139
Dry Onions	3	44	20	65	132

Source: 1982 U.S. Census of Agriculture and unpublished data from Department of Agriculture and Resource Economics, University of Massachusetts, Amherst.

TABLE 4

LAND IN TREE FRUIT IN WESTERN MASSACHUSETTS, 1982

	Berkshire	Franklin	Hampden	Hampshire	Total
Apples	293	999	893	725	2,910
Cherries	2	2	4	2	10
Grapes	3	2	8	4	17
Peaches	1	40	47	33	121
Pears	6	3	15	14	38
Plums	-	-	7	-	7
Total:	305	1,046	974	778	3,103

Source: 1982 U.S. Census of Agriculture

TABLE 5

LAND IN SMALL FRUITS IN WESTERN MASSACHUSETTS, 1982

	Berkshire	Franklin	Hampden	Hampshire	Total
Blueberries	n.a.	17	64	29	110
Raspberries	3	14	n.a.	2	19
Strawberries	12	43	94	30	179
Total:	15	74	158	61	308

Source: 1982 U.S. Census of Agriculture

Selected farm expenses are the subject of Table 6. Although a high proportion of farm inputs are imported from other regions of the country, the suppliers of these items are local. Thus the farm sector supports a service industry which supplies the farm sector with inputs. This farm service sector is largely local and critical to the success of our regional agriculture. While feed for livestock is the largest expense category, the second most important expense item is hired farm labor. This item is important not only because it is such a large expense item, but also because, for the most part, hired farm labor is drawn from the local labor force. Thus agriculture employs more than just the farm families of the region. Table 7 shows hired farm labor statistics which indicate that 485 farms employed 1524 people for over 150 days. An additional 4284 people were employed for less than 150 days.

TABLE 6

SELECTED FARM PRODUCTION EXPENSES FOR WESTERN MASSACHUSETTS, 1982, ($1,000)

	Berkshire	Franklin	Hampden	Hampshire	Total
Livestock & Poultry purchased	501	623	450	937	2,511
Feed	4,121	4,669	2,319	5,289	16,398
Seeds	259	367	475	650	1,751
Fertilizer	460	1,070	550	1,306	3,386
Chemicals	96	398	303	605	1,402
Hired Farm Labor	1,064	2,604	2,419	3,379	9,466
Contract Labor	24	84	261	220	589
Custom Work	70	256	98	83	507
Energy & Petroleum Products	1,292	1,703	1,335	2,263	6,593
Interest Expense	815	900	664	1,223	3,602
Total:	8,702	12,674	8,874	15,955	46,205

Source: 1982 U.S. Census of Agriculture

TABLE 7

HIRED FARM LABOR IN WESTERN MASSACHUSETTS, 1982

	Berkshire		Franklin		Hampden		Hampshire	
	Farms	(Workers)	Farms	(Workers)	Farms	(Workers)	Farms	(workers)
Farms With:								
1 workers	32	(32)	99	(99)	34	(34)	33	(33)
2 workers	57	(114)	24	(48)	45	(90)	37	(74)
3-4 workers	48	(162)	83	(288)	31	(106)	80	(299)
5-9 workers	34	(219)	63	(370)	42	(245)	57	(367)
10+ workers	10	(150)	23	(762)	37	(1055)	54	(1261)
Total:	181	(677)	292	(1567)	189	(1530)	261	(2034)
Workers with:								
150+ days worked	103	(277)	145	(438)	85	(334)	149	(475)
under 150 days worked	133	(400)	246	(1129)	157	(1196)	232	(1559)

Source: 1982 U.S. Census of Agriculture

Importance of the Farm Sector

The statistics at hand are all aggregates except for the 1982 Agriculture Census. To attempt to identify the importance of the farm sector on a regional basis rather than on the state level is very hard, as gross regional product is not computed. For this section, state-wide figures will be used and, where appropriate, estimates will be made on the contribution of the farm sector to the region's economy.

Value added (the difference between value of output and value of purchased materials and services) is the best measure of relative importance of an economic sector. It shows the contribution of a sector to gross national product, or gross state product at the state level. About 2.0 percent of Massachusetts' gross state product may be attributable to goods which originated in the farm sector, when marketing and support activities are included. The farm sector contribution to gross state product in 1981 was nearly $1.4 billion (the above and much of the following is from an unpublished report by D.A. Storey, Department of Agriculture and Resource Economics, University of Massachusetts, Amherst).

Value added equals the payments to various production factors. The value added payments of the farm sector create incomes to firms and individuals which are re-spent and generate incomes throughout the sector known as the food and fiber industry. These sector-wide effects are known as multiplier effects. The multiplier effects associated with agriculture are higher than those associated with value added in other industries. One reason for this is that agriculture generates employment and income at three levels: production, service, and basic industry. Some economists suggest that in the more industrialized states the multipliers for agricultural value added may be twice as great as those for manufacturing.

Estimates of value added have been developed for different production activities in the farm sector (Kunz and Purcell, 1981). The total value added for farm sector production in Western Massachusetts in 1982 would have been $46,782,000 (Table 8).

On a national basis, a dollar of value added on a farm in 1982 resulted in a little over $7.00 value added in the total food and fiber system. For Massachusetts and the western region it would be well to take a conservative viewpoint in estimating the contribution of a dollar added value on one of our farms to the region's or state's total food and fiber sector's share of gross product. Reasons for such a conservative perspective include: 1)specialized agricultural support services such as farm supply manufacturing are for the most part located outside of the region; 2) our farm products require relative short transportation hauls before reaching customers; 3) our farm products are more likely to be marketed unprocessed. An offsetting argument is that our farm production is labor intensive and there may well be a higher direct multiplier here in farming than elsewhere in the country.

If conservative assumptions are made, each dollar of value added on a Western Massachusetts farm will contribute, because of multiplier effects, $5.00 value added to the total food and fiber system of Massachusetts. In 1982, our regional agriculture would have been responsible for a contribution of $233,910,000. to the gross product of Massachusetts.

TABLE 8

ESTIMATED VALUE ADDED IN THE FARM SECTOR, WESTERN MASSACHUSETTS, 1982

Production Activity	Value of Production ($1000)	Value Added Factor	Value Added Amount ($1000)
Dairy	$38,731	0.63240	$24,493
Poultry	5,759	0.46966	2,705
Cattle & Calves	4,948	0.59062	2,922
Sheep & Lambs	186	0.54707	102
Hogs & Pigs	576	0.33858	195
Other Livestock	783	0.48648	381
Tobacco	2,494	0.99301	2,477
Grain	796	0.62439	497
Hay & Silage	1,946	0.69692	1,356
Vegetables	6,912	0.60382	4,174
Fruit	5,606	0.94981	5,325
Nursey	6,738	n.a.	n.a.
Other	3,717	0.57973	2,155
Total:	$79,192		$46,782

Source: 1982 U.S. Census of Agriculture
Kunz and Purcell (1981)

Recap and Summary

In Western Massachusetts in 1982 there were 1824 farms holding 14 percent of the land in the region (260,305 acres). In the years between 1974 and 1982 the number of farms in the region increased by 20 percent and accounted for 34 percent of the farms of the Commonwealth. The market value of sales of Western Massachusetts farms totaled $79 million or 28 percent of the total market value of farm products for the state. Accounting for value added, and using a conservative multiplier, the farm sector contributed a total of $233 million to the gross product of Massachusetts.

By value of sales, the most important crops in the region, in descending order, were: dairy ($38 million), vegetables ($7 million), nursery and greenhouse products ($6.7 million), poultry ($5.7 million), and fruit ($5.6 million). In 1981 the Pioneer Valley accounted for 43 percent of the total vegetables and 53 percent of the milk produced in the state.

While feed was the most important expense item of farms in Western Massachusetts in 1982, hired farm labor was the second most important item. The cost of farm labor accounted for over $10 million in direct cash outlays to regional workers. The total number of people employed by Western Massachusetts farms, not including farm family labor, during 1982 was 5808.

The above statistics indicate that agriculture in Western Massachusetts is an important and viable sector of the region's economy. Other statements attesting to its value come from those in the tourist industry who state that farmland adds to the scenic value of the region. Also, efforts on the part of the state's government to keep land in agriculture, (millions of dollars have been spent to purchase development rights to agricultural lands), attest to the desire of the people of Massachusetts to have a continuing agricultural presence.

Economic development is of great importance to the region. However, development should be managed so that it does not erode one of the reasons people are attracted to the region: open and farmed spaces. Indeed economic development can aid the farm sector of the region. One of the major vegetable crops in the region is cucumbers. Cucumber production reflects the demand of a local processing plant's need for cucumbers for pickling. There are opportunities for similar ventures that would process or package or, in someway, support the region's farm sector.

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II. Food Related Industry in the Northern Tier: Overview from a Report on the Northern Tier Economy

By: Mt. Auburn Associates

Introduction

The food-related industries in the Northern Tier include traditional and alternative agriculture; companies in the food products industry; agricultural biotechnology companies; and companies in the food processing machinery and packaging industries. It is extremely difficult to estimate the total number of jobs in these related industries. In 1984, the state reported only 260 jobs in agriculture and forestry and 290 jobs in food processing. As discussed earlier, these numbers are a low estimate of the importance of agriculturally-related products. Though data on the value of the produce sold by the region are scarce, one source estimates that the retail value of the produce grown in Franklin County is between $9 million and $12 million a year.

Despite the fact that rural economics in most parts of the U.S. have been badly hurt by the current conditions of the agricultural sector, Massachusetts and New England farms have been meeting with a fair amount of success. In fact, the number of farms in the New England region actually have been increasing. The success of New England farms is largely tied to their low debt service, their involvement in product diversification, and their marketing techniques, which are primarily oriented towards direct sales to consumers. As one indication of the sector's health, the Springfield Farm Credit Bank is the healthiest financial institution in the U.S. Farm Credit System.

Agriculture in the Northern Tier is primarily composed of orchards, dairy farms, maple sugar producers and vegetable farmers. The Department of Food and Agriculture in the state estimates that there are about 834 agricultural activities in the area (including horticulture, a large part of agriculture in the region). There are at least 6 apple orchards in Franklin County alone.

Efforts in "alternative agriculture," such as natural hydroponic farming, also have proved successful in the region. The Northern Tier's attractiveness as a site for new forms of agricultural production is illustrated by the recent interest of a European company in producing hydroponically-grown Belgian Endives in the Greenfield area.

The rural nature of the region and its quality of life also has attracted a number of companies in the food products industry, particularly in the Greenfield area. This industry is potentially critical in providing added value to locally grown agricultural produce. A good example of such local linkage is Oxford Pickle, which purchases 70% of the cucumbers it needs from

local farmers.

The food product companies in the Northern Tier are focussed mainly in the natural and specialty food markets. These companies range from Tomsun Foods, the largest non-oriented tofu producer in the world, to small cottage industries located in people's homes. Food-related products manufactured in the region include pickles by Oxford Pickles, natural bakery items by Baldwin Hill Bakery, Tempeh hot dogs by Tempeh Works, Jofu, a yogurt like product make by Tomsum, natural snack foods and granola by Energy Food Factory, flavored bean sprouts by a local hydroponic farmer, kefir and eggnog by the New England Country Dairy, Bart's ice cream, goat cheese at Westfield Farm in Hubbardston, Gouda cheese from Smith's Country Cheese in Winchendon, and apple cider from a number of cider mills throughout the Northern Tier.

Although food-related products account for only about 300 jobs in Northern Tier, increased growth is expected. Most of the companies interviewed are involved in producing new products and so are forecasting rapid growth. Energy Food Factory, which is interested in expanding in the Greenfield Industrial Park, has developed an innovative new snack food which has already received a lot of interest from supermarkets. New start-up firms also are being proposed, the most well-known being Earth's Best, a natural baby food company. The job numbers also do not account for the small home-based, food-related products being developed throughout the region.

The third agriculturally-related industry developing in the region is biotechnology. The best known biotechnology company in the region is Nourse Farms, which is on the cutting edge of plant tissue technology. This company has produced a new strain of strawberry plants. In response to the problems in asparagus production in the western part of the state, it currently is working on a strain of asparagus which would be more disease resistant. Ultimate Conception, an agriculturally-oriented biotechnology company involved in animal embryo transfers, is moving to the Greenfield area.

Finally, there are a number of companies in the Northern Tier that are involved in food processing technology and packaging equipment. These companies range from a plastics company that manufactures food containers to Kontro, an Athol-based company that develops machinery for the food processing industry.

Economic Development Potential of Food-Related Industry

Current trends in the U.S. food products industry and a solid base in the Northern Tier make the further development of this industry a good target for economic development. Specific targets for development include:

1. organically-grown and specialty produce

2. specialty food products

3. agriculturally-oriented biotechnology

4. innovative food packaging companies

5. food processing machinery companies

The first major trend affecting the food industry is changing consumer buying habits and demographic trends. The increased number of working women and single family households, the increase in the elderly population, and the maturing of the baby boom generation are having a profound impact on food buying habits. These changes are already evident in changing consumer tastes. Analysts of the food industry consistently note that the major changes in consumer tastes are greater demands for convenience foods, health foods, and ethnic foods. A recent newsletter of the food industry emphasizes the importance of diet and health as the new factors for consumers making food choices. The other major trend in consumer behavior is the rapid rise in eating outside of the home. The result is the food service market--made up of restaurants, lodging places, and institutions --is growing rapidly. One market analysis estimated sales at about $182 billion.

With the new interest in health and freshness and the maturing of the baby boom generation, there has been significant expansion in the "specialty food" industry. Specialty foods were defined in a recent article as "premium products with an emphasis on high quality ingredients, outstanding taste and packaging" (Venture, April 1986). Companies producing these goods generally manufacture in small batches and are able to sell at premium prices.

Until very recently, these products were sold primarily in gourmet food shops. However, with increased demand all major supermarket chains now shelf specialty food products. The industry sold only about $2 billion in 1980, but now has a market estimated at $3.5 billion. A recent study by Frost and Sullivan estimated that the industry will experience a 20% annual growth rate.

The second trend that is affecting the food products industry is rapid technological changes in the food manufacturing process. The most dramatic changes are in food packaging, with much of the innovation in the industry aimed at extending the shelf life of fresh foods. Major companies in the food industry have switched to packaging with plastics. It is expected that plastics will soon become the second most popular packaging material, supplanting glass (Food Engineering, August, 1984). Polymer research aimed at addressing some of the remaining problems in plastic packaging is occurring in many of the major

food companies. Aseptic packaging in particular is growing from a base of zero in 1981 to a projected market of $6 billion in 1990. Other trends in process technology are in the area of food irradiation, computer-based automation, and inspection systems.

Finally, new food products are being developed that are produced through biotechnology techniques. Plant biotechnology involves the use of biological processes to improve the taste, texture, disease resistance, and handling of agricultural products. It is estimated that there are about 75 companies in this emerging field. The most well-known new product to come out of this emerging industry is "VegiSnax" a packaged celery stick which is crisper, brighter and free of tough strings. As another product example, biotechnology is being used to improve cheesemaking through genetically-produced rennin enzymes.

Forecasts on the size of the worldwide market for biotechnology-related agricultural and food processing products and supplies range from $430 million in 1990 to $100 billion in the year 2000 (Prepared Foods, January, 1986). One study predicts the sale of food prepared through biotechnology to reach $94 million in 1989, while another study projects sales of $11 billion by the year 2000. It is estimated that seed produced through manipulating plant cells in tissue culture will be a $190 billion industry in 1990 (High Technology, May, 1986).

The Northern Tier is well positioned to take advantage of many of these trends in the food products industry. The region's most important resource in this region is the Food Science Department at the University of Massachusetts. This department, one of the oldest of its kind in the country, is actively engaged in a wide range of research activities related to new food products and new processing and packaging technologies. Activities of the faculty include research in ultrasonic pasteurization techniques for sanitation and cleaning, immobilized enzyme research useful in cheese-making technology, the development of fat-free potato chips and hot dogs made from fish, the quick cooling of pouched foods, and machine design for food production. The department also has a pilot food processing plant which is open to local companies for testing and evaluation.

The potential of the University in the development of innovative food-related products could increase in the future. The department is currently considering developing a "Food Science and Technology Center" which could provide technical advice to small companies in the food industry, provide facilities for research and development activities, and carry out research and development activities. In addition, the University is proposing another center to focus on agriculturally related biotechnology.

In addition to the presence of the University, there are a number of other reasons for a development strategy to target the

specialty food industry, the technological advances in processing and packaging, and the growing biotechnology industry in the Northern Tier:

. The Greenfield area already contains a number of innovative companies in the specialty food market and biotechnology market that could benefit from trends in the industry. To a large extent the human capital base needed to take advantage of opportunities is already present.

. The Northern Tier's proximity to the Boston market, which exemplifies many of the changing tastes in consumer spending and demographic shifts has never been fully exploited. Bildner and Sons, one of the leading companies in the retailing of specialty foods, and Bread and Circus, another specialty retailer with stores throughout Massachusetts, provide a ready market for new products. The new interest in regional foods among restaurants in Boston also could open up new markets for local farmers.

. The quality of life in the region is important in attracting the type of entrepreneurs involved in this industry and in creating a positive "image" for marketing local products. A number of the existing specialty food companies noted that they were in the region because of its quality of life.

. The new efforts to promote the region's tourist industry could open up new markets for specialty food producers. With increased exposure, particularly from the eastern part of the state, the image of the region as a producer of quality food products could be enhanced. Farmers in the area would also benefit from an increased market for directly selling their produce.

. The region's expertise in the area of plastics and specialized machinery could be adapted to the food industry. The proximity of the Polymer Center at the University of Massachusetts, the growing plastics industry, and the general availability of high skilled labor in the machining trades may open opportunities in the region for getting involved in some of the innovations in these markets. The region's traditional strengths in developing specialized machinery also could be used in developing machinery to meet the needs of the food products companies.

. The Whole Herd Buyout Program sponsored by the U.S. Department of Agriculture has created a number of farms looking for new product markets to enter. This program, which purchased dairy herds to control the price of milk, resulted in the loss of about 10% of the dairy farms in the state and 19% of milk production capacity. The availability of the land and talents of these farmers represents a potential opportunity in the agricultural area.

. The state Department of Food and Agriculture and the

Department of Commerce and Development are actively promoting the development of food-related industries. The Commissioner of Food and Agriculture is very committed to promoting local produce and products. His department has linked farmers with restaurant owners and prepared brochures on food products developed in the state. The Department of Commerce and Development has recently established the Massachusetts Fine Foods and Artisanry Program. This program jointly sponsored with the Department of Food and Agriculture a Massachusetts Fine Food Pavilion at the Cuisine '86 Culinary Expo in Boston. In addition, the program is developing a Fine Foods Association in the state, expects to produce a catalogue of quality products, and will be sponsoring a Massachusetts exhibit at the New York Gourmet Food and Wine show in November. Finally, the Department of Commerce and Development has explored the possibility of establishing a state-sponsored canning facility in Western Massachusetts. These new efforts could be instrumental in providing the support for a more targeted effort in the Northern Tier.

Elements of Success in Food Product Development

There are two potential constraints to the development of food-related products in the region that need to be addressed. First, the industry is extremely competitive. There has been a dramatic rise in the number of new products on the nation's grocery shelves. A 1985 article noted that there were 20 or more new products a week, double the number of a few years ago. A more recent article estimated that 263 new food products and brand extensions were introduced this May alone (New York Times, June 8, 1986). The ability of a retail-oriented food products company to get shelf space basically determines whether or not the company succeeds. As another indicator or rising competitiveness in the industry, the intensity of merger and acquisition activity has risen significantly in the past few years. Between 1948 and 1968, $5 billion was spent on mergers in the industry. In 1984 alone, just two companies accounted for over $5 billion in mergers, and there were 583 acquisitions in the industry. The increased size of industry firms has boosted the level of competition.

As a result of the competitive pressures in the industry, a small manufacturer will have to develop innovative ways to get its products on the shelves or develop specialized niches that the food conglomerates are unlikely to enter. A small food manufacturer recently noted in Food Engineering, "With the food industry becoming increasingly competitive and companies being absorbed by larger food giants, developing new products and innovative methods is our way as a small company not only to survive but to compete effectively as well." Another specialty food producer found that getting shelf space required a "guerilla approach"--the managers needed to go directly to the stores and stock and restock their product.

It is clear that creative marketing and "nichemanship" will

be the key to success in the specialty food markets and in agricultural production. Innovation in the area of packaging technology and process technology may also be able to provide local companies with the competitive edge they need to survive.

The second major constraint in the development of the food products industry is the availability of financing. Risk capital will be needed by start-up enterprises and expansion capital by existing companies to be able to take advantage of new opportunities. These capital needs may pose a problem given the nature of the financial market in the region and the lack of a state financing program able to adequately meet the needs of agriculturally-related industries. Our survey of local bankers found little interest in the food processing industry; a local company wishing to expand has recently been turned down by three local banks. Addressing the financing needs of food product companies may become critical to the success of development efforts.

The success of the region in developing food-related enterprises that are able to survive and grow in this competitive environment lies in forging new relationships among businesses in the agricultural, food products and process technology areas and between the University and local businesses. The public sector can play the key role of catalyst in the development of these new relationships and also provide resources needed to support innovative efforts to promote the region's industry.

III. Directions: A Proposed University-Industry Partnership

Through the Northern Tier Project, a proposal has been formulated to establish a University-Industry Partnership involving the Food and Agribusiness Industry and the Departments of Food Science, Food Engineering and Agricultural and Resource Economics at the University of Amherst, Massachusetts. A Program would be established to provide scientific, technological and economic research assistance to the food and agribusiness industry. An outline of the proposed Center follows:

University-Industry Council

. The following entities/partners will be represented on the Council:

1. University of Massachusetts: appropriate administrators & deans; participating departments; Small Business Development Center.

2. Industry: major supermarket chain; a Growers Association; small and medium-sized food processing businesses.

3. Government: Commissioner of Agriculture; area legislators; state economic development agency or department.

4. Franklin County Community Development Corporation.

. Function of the Council:

1. Provide overall direction and policy for the Center.

2. Develop a mechanism for identifying and soliciting technical assistance projects.

3. Develop a long-term program plan that would secure an economically viable future for the food and agribusiness industry.

Program

. **Scientific and Technological Assistance to Existing Businesses**

Through a series of discussions with the industry, a number of immediate and short term needs were identified. A program of on-site consultation, direct technical assistance and applied research will be developed to meet those needs. The program will include, but not be limited to, the

following:

product testing	waste disposal management
shelf life studies	access to pilot plant facilities
production research	new product development research
nutritional evaluation	quality assurance & control studies
packaging systems research	radiation analysis
sensory evaluation of products	
computer-based technology	
residue analysis	

Industry Assessment

To assure the long-term economic viability of the industry, a comprehensive analysis will be undertaken that will identify areas of growth potential for the region's businesses, and determine the long-term scientific and technological needs of companies in the food and agribusiness industry.

The analysis will include:

1. A thorough, strategic market analysis of new and existing product lines to determine: which markets are optimal? What promotion strategy fits the chosen products? What distributional obstacles exist?

2. An investigation of potential market niches in consumer demand that a yet-undeveloped product might respond to.

3. A comprehensive analysis of the region's agricultural base (activity and potential) and its relationship with the industry (i.e.: what linkages now exist? Where do additional opportunities lie?).

. **Technical Assistance for New Industry Enterprises**

As new businesses are started in the region, these companies will require:

1. Assistance in establishing a food technology incubator.

2. Provision of laboratory services for product development, testing and research.

3. Assistance in determining facilities and infrastructure needs for new plants or plant expansion.

Geographical Target Area

Because of strong organizational base and an effective working relationship with the vast majority of food and agribusiness companies in the region, the Northern Tier will be the principal

area of focus.

Servicing this relatively restricted geographical area, at least at the outset, respects the resource capacity of the various University Departments, and offers greater chances for successful program implementation.

Nonetheless, serious consideration will be given to servicing 2 to 3 businesses that lie outside the target region. This would assure a proper balance (with respect to size of business, type of product processed or manufactured, type of production process, etc.) of companies the Center will be working with.

Resources

- **Department of Food Science and Nutrition**

  The research conducted in the Department spans the spectrum from basic to very complex applied product development. The physical facility of the Department is extensive and suited to a variety of research ranging from the study of basic chemical phenomena to biotechnology to product development.

  Specialized facilities of the Department include:

  marine food laboratory
  color laboratory
  pilot plant
  meats laboratory
  packaging laboratory
  thermal processing laboratory
  mutagen screening laboratory
  nutrient data bank
  mass spectrometer laboratory

- **Department of Food Engineering**

  Engineering principles have been applied to food processing for many years but "food engineering" is a new, emerging and separate branch of engineering education and professional practice.

  Specialized facilities of the Department include:

  extruder
  vacuum mixer
  electrodialysis and ultrafiltration modules
  coaxial and capillary rheometers
  scanning spectrophotometer
  freeze drier
  multiple-effect brine-driven evaporator
  spray drier
  process cheese cooker
  countercurrent leaching system
  Instron universal testing machine
  differential scanning calorimeter
  mercury porosimeter
  freeze concentrator
  instruments for physical and chemical analysis

. **Department of Agricultural and Resource Economics**

The mission of the Department of Agricultural and Resource Economics is to create and disseminate knowledge about the application of economics to public and private decision making on issues in Massachusetts regarding agriculture, food marketing, rural development, natural resource use and environmental quality. Faculty expertise lies in the following areas:

the internal organization of the larger agribusiness firm
benefit-cost analysis
economics of the large vs. small processing firms
economics of waste disposal
the legal environment (e.g. food safety and anti-trust laws) and public policy in the food system
consumer issues in the food system
structure and performance of the food system
production economics, econometrics, and forecasting techniques
the economics of food processing and retail distribution

. **Franklin County Community Development Corporation**

The Franklin County CDC, established in 1978, is a private non-profit community and economic development organization which serves the twenty-six towns of Franklin County. Throughout its history, the CDC has concerned itself with improving the climate for economic development in the region. This has been undertaken through direct financial and technical assistance programs for small business development as well as community economic development planning initiatives targeted at communities or industries which have experienced particular economic problems.

In recent years, a primary focus of the CDC has been the development of alternative employment opportunities for workers displaced by plant closings and layoffs in the machine trades. Through the Machine Trades Action Project, the CDC has developed and implemented a three-prong strategy for revitalizing this industry, which included strategic marketing, technology transfer and innovation, and entrepreneurship development.

These strategies have equal applicability to other important sectors of the region's economy, such as the food industry. For several years the CDC has been greatly involved with the county's burgeoning food industry through its business assistance programs. Through packaging over $2 million in financial assistance for food processing businesses in the country, the CDC has developed a unique understanding of and rapport with the industry and its actors. Over the past three months, working in partnership with the Northern Tier

Project, the CDC has helped initiate the development of a local Food Industry Council that would provide the local food industry with direct access to technical expertise available at the University of Massachusetts to meet their Research and Development needs. The promotion of resources based industries in Franklin County has been a primary goal of the CDC as it has worked to establish a balance between economic growth and the preservation of the region's rural character.

. **The Small Business Development Center**

The Small Business Development Center is a University-based technical assistance program that operates through the School of Management. The S.B.D.C. program provides one-on-one management counselling to small businesses, and education and training through a network of regional centers. The S.B.D.C. has had a very strong relationship with the Northern Tier, with outreach and assistance centers located in Gardner, the Athol/Orange area, Greenfield and North Adams. Services provided by the S.B.D.C. are in the areas of:

Financial planning
Preparing financial proposals
Venture capital formation
Debt financing alternatives
Market research

Potential Research and Technical Assistance Projects

Below are examples of the kind of research and technical assistance projects that could be undertaken within the framework of the proposed program. Final decisions, of course, on any projects will be made by the Council.

1. Perform a design and economic feasibility study of a cooperative facility (such as has been built in Ducktown, TN) for grading, packing, and processing of locally grown crops. Of particular interest will be approaches which lead to minimal processed products of likely value in supermarket and restaurant salad bars.

2. Investigate methods of separation of off-grade food products from glass, paper, cardboard, plastic, or metal containers so the containers may be put in landfills without accompanying large amounts of wet organic materials.

3. Investigate low cost processing methods, including winter storage, which will enable land disposal of food wastes at minimal environmental nuisance while maximizing fertilizer and soil amendment attributes.

4. Investigate cultivation, harvesting, storage, and processing

methods needed for new crops (such as Belgian endive) and/or for achieving dramatic reductions in herbicide use with existing crops.

5. Assist companies in the design, testing, evaluation and market demand for new or modified products.